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(54) Sliding door catch

(57) A sliding door (10) catch for holding the door in its fully open position (right hand side) consists of a stopper (34) secured to a guide rail (18), a hooked lever (44) pivotally mounted on a roller assembly (20) for engagement with the stopper (34) when the sliding door (10) is in its fully open position, and a spring (36) urging the hooked lever (44) in the direction for engagement with the stopper (34). The improvement over a known catch comprises a first abutment portion (44d) on the lever (44) for contact with corresponding portion of an anchor bracket (46) and a second abutment portion (44e) for contact with a corresponding portion of a roller bracket (22).

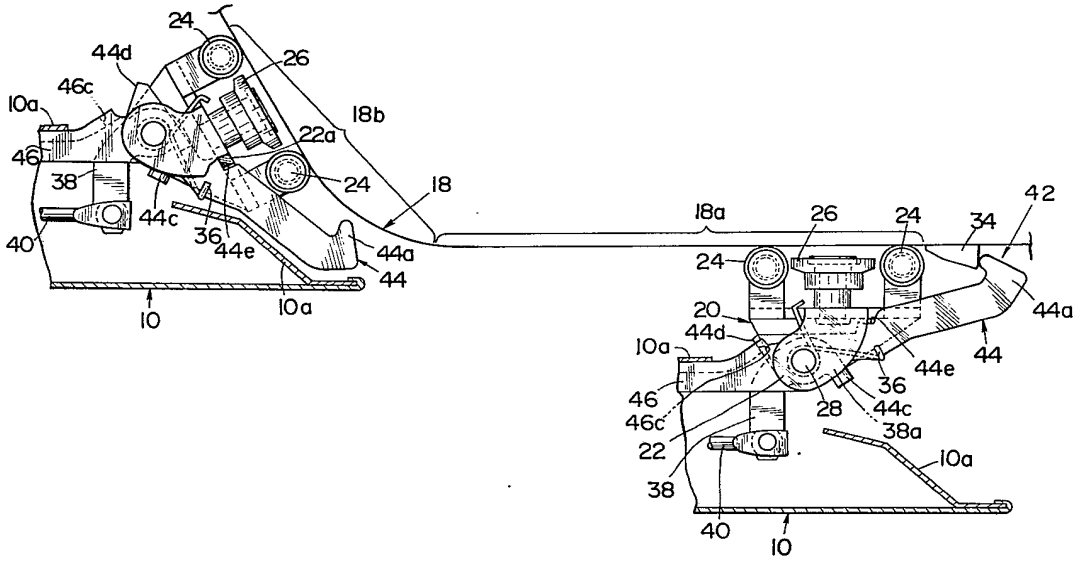

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FIG.1

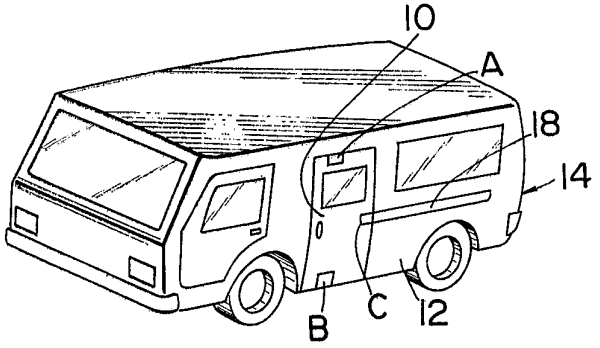

FIG.2

FIG.3

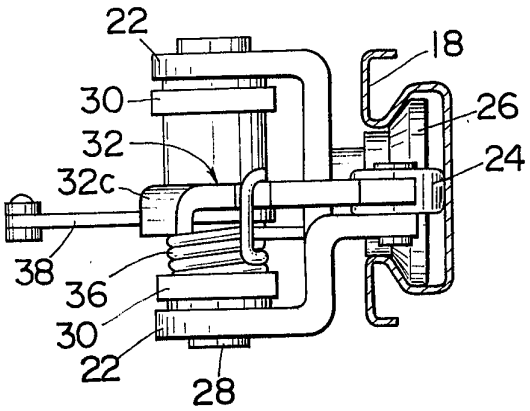

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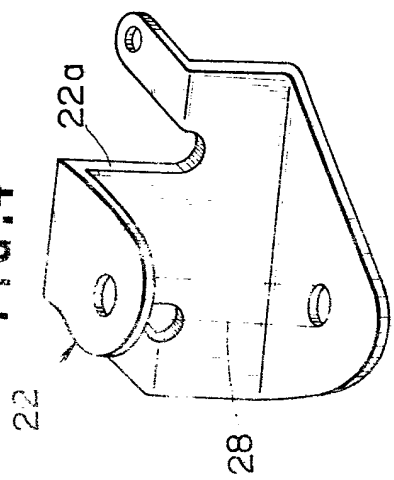
FIG.4



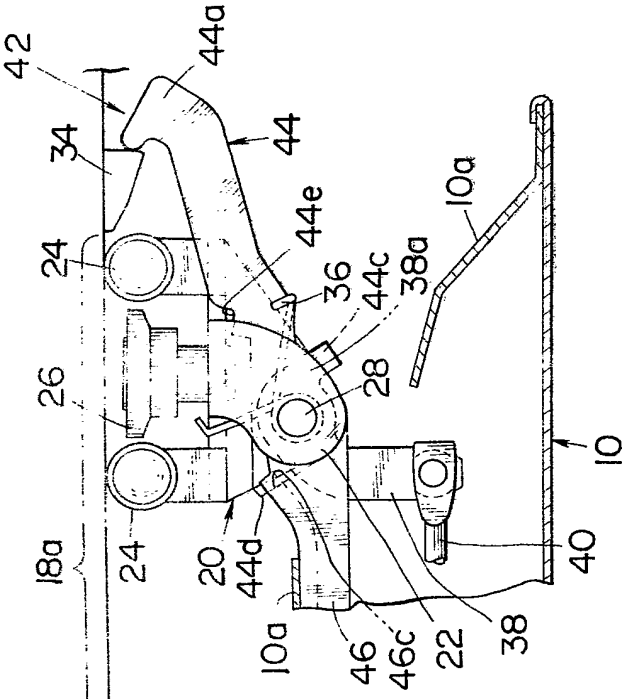


FIG.6

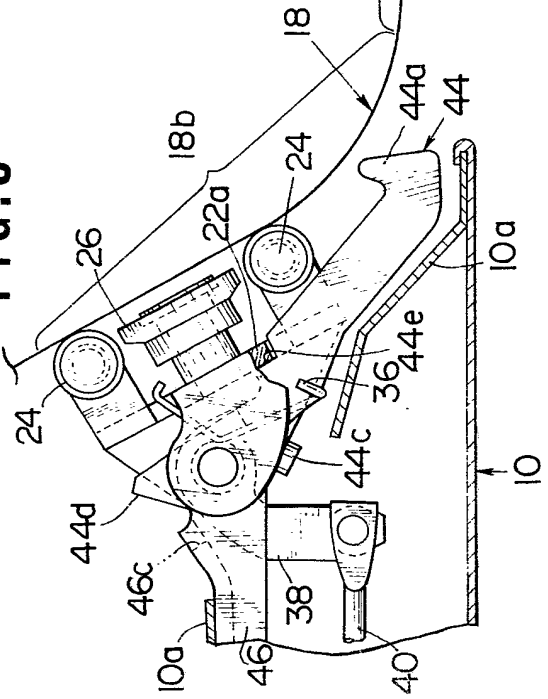


FIG.5

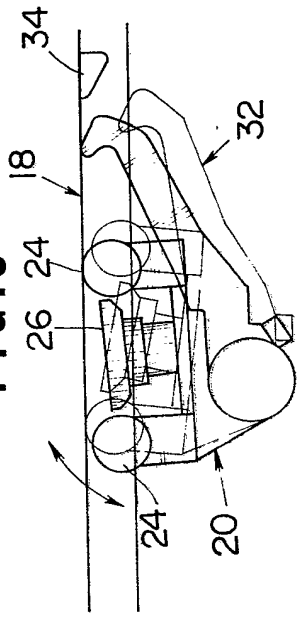


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FIG.7A

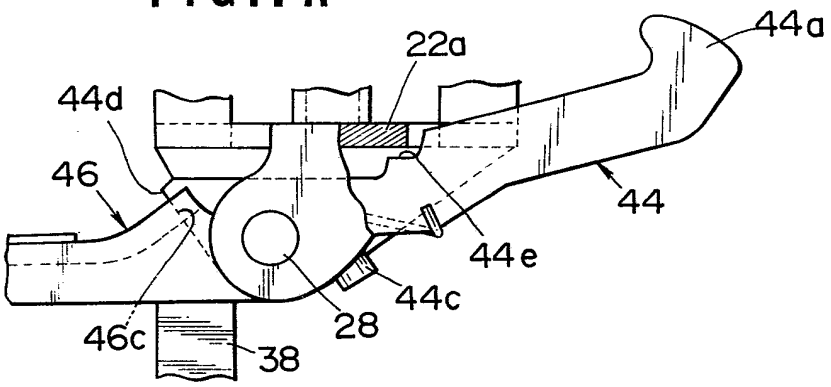

FIG.7B

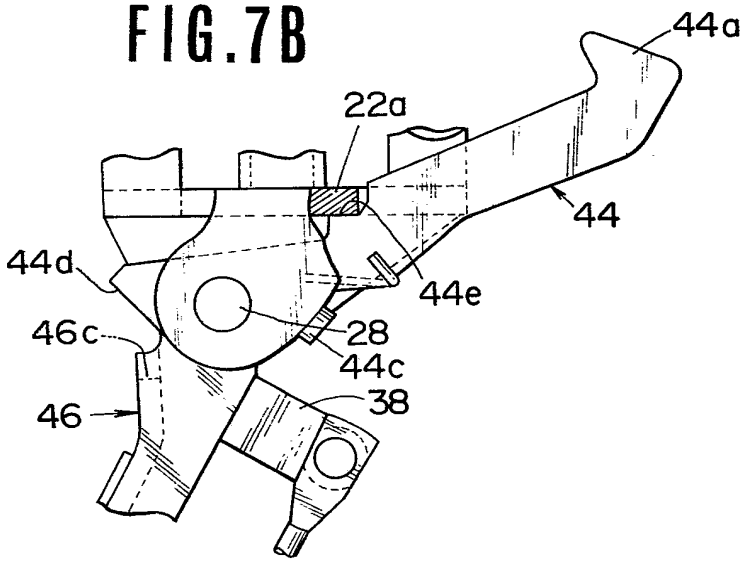

FIG.8

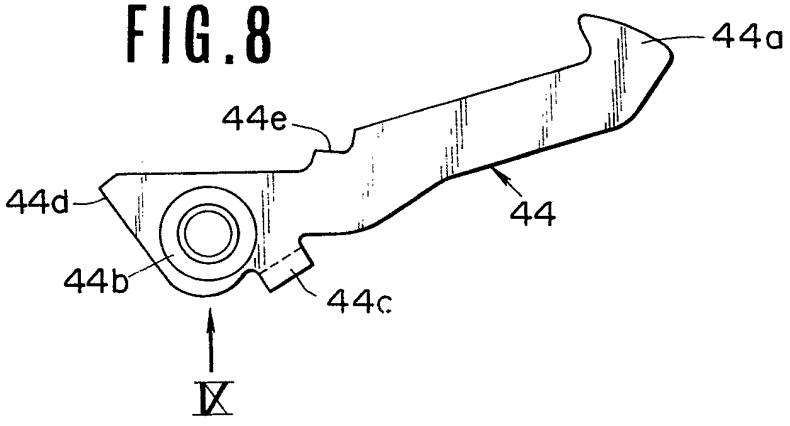

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FIG.9

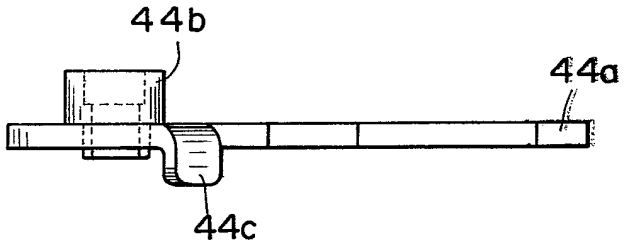


FIG.10

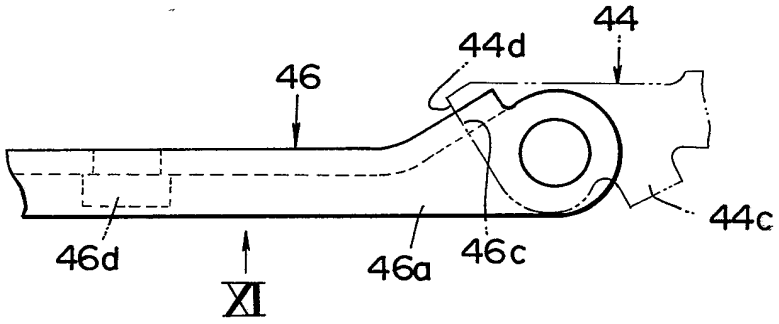
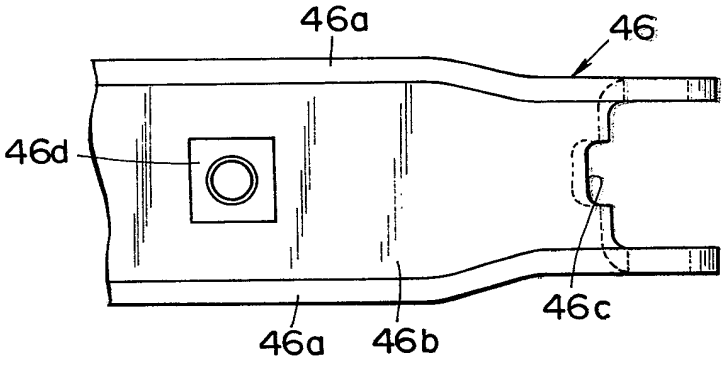


FIG.11



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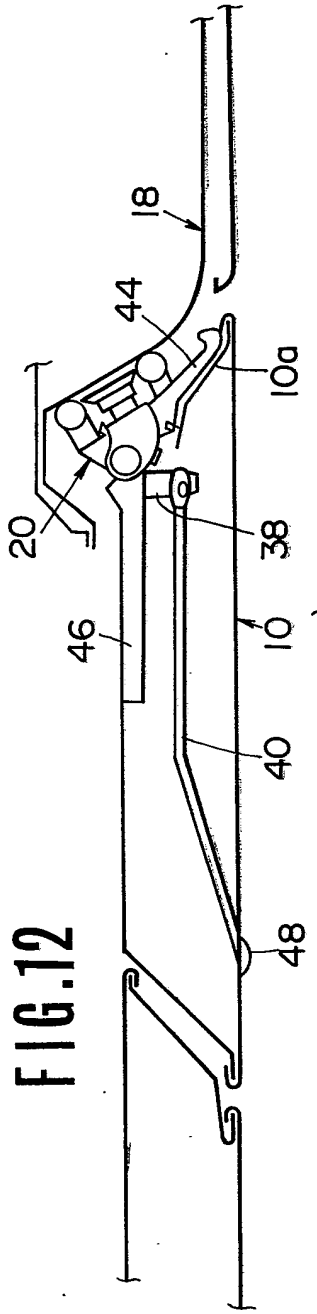

FIG.12

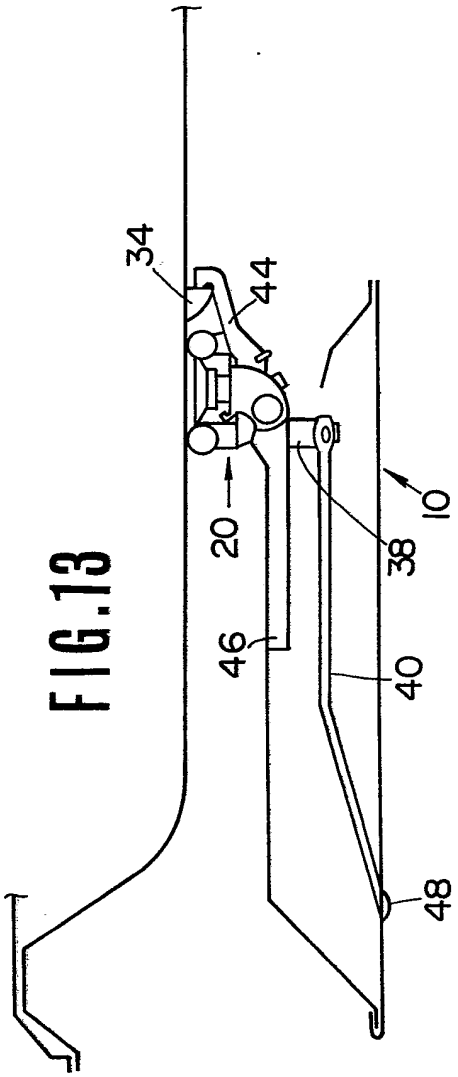

FIG.13

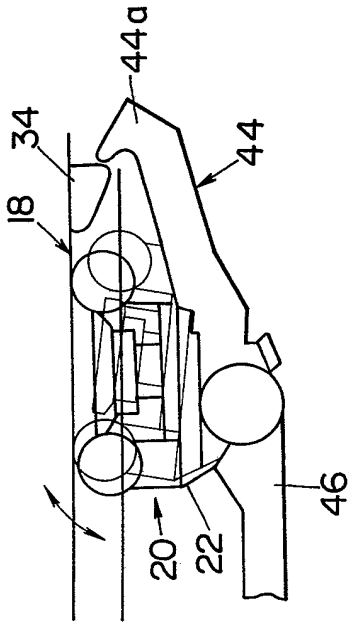

FIG.14

SPECIFICATION

Means for holding a sliding door in its fully open position

The present invention relates to sliding door mountings for motor vehicles and particularly to means for holding a sliding door in its fully open position.

A sliding door of a motor vehicle is usually suspended at three points, i.e., at its front end at the top and bottom and at its rear end in such a manner that when it is shut it lies flush with the side wall of the vehicle in which it is fitted and when it is opened it first projects outward of the vehicle body and then slides parallely along the vehicle side wall. For this end, a sliding door mounting is provided with a roller assembly pivotally connected to the rear end of the sliding door and adapted to run along a guide rail extending along the vehicle side wall.

The sliding door mounting is also provided with means for holding the sliding door in its fully open position in order to prevent a passenger who is getting in or out of the vehicle from being caught in the sliding door. The holding means mainly consist of a hooked lever installed on the roller assembly and a stopper secured to the guide rail for engagement with the hooked lever.

A disadvantage of the prior art holding means is that the hooked lever has a possibility of being pressed against the guide rail to make a disturbing noise when the sliding door is being opened or closed.

Another disadvantage is that under a certain condition the holding means fail to function properly, i.e., cannot hold the sliding door in its fully open position.

A further disadvantage is that the hooked lever is subject to such design restriction to inadequate in the strength.

It is an object of the present invention to provide a sliding door mounting with improved holding means which are free from the disadvantages noted above.

In accordance with the present invention, there is provided a sliding door mounting in a motor vehicle, having a guide rail secured to the vehicle body, an anchor bracket secured to a sliding door, a roller assembly pivotally mounted on the anchor bracket and adapted to run along the guide rail, the guide rail having a first guide rail section adapted to guide the sliding door substantially parallely along the outer surface of the vehicle body while holding same in a condition projected outward of the vehicle body and a second guide rail section adapted to guide the sliding door along a path turned laterally of the vehicle body and thereby allow the same to be pulled in or pulled out from its fully closed position where it lies flush with the outer surface of the vehicle body, the roller assembly being caused to rotate relative to the sliding door when running along the second guide rail section, and means for holding the sliding door in its fully open position, the holding means having a stopper secured to the guide rail, a hooked lever pivotally mounted on the roller assembly for engagement with the stopper when the sliding door is in its fully open position and a spring urging the hooked lever in the direction for engagement with the stopper, characterized in that the hooked lever has a first abutment portion for contact with a corresponding portion of the anchor bracket under the bias of the spring and a second abutment portion for contact with a corresponding portion of the roller assembly under the bias of the spring, that the first abutment portion is adapted to be held in contact with the corresponding portion of the anchor bracket at least when said roller assembly is running along the first guide rail section for thereby holding the hooked lever in a predetermined constant state suitable for engagement with the stopper irrespective of rotation of the roller assembly, and that the second abutment portion is adapted to come in contact with the corresponding portion of the roller assembly when the roller assembly, which is running along the second guide rail section toward its extreme position where it holds the sliding door in its fully closed position, runs into a predetermined position and thenceforth to cause the hooked lever to rotate together with the roller assembly while at the same time allowing the first abutment portion to go away from the corresponding portion of the anchor bracket.

The features and advantages of the holding means according to the present invention will become more clearly appreciated from the following description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a perspective view of a box-type vehicle having a sliding door for closing an opening in the side wall of the vehicle body;

Fig. 2 is a schematic top plan view of a prior art sliding door mounting with means for holding the sliding door in its fully open position, the mounting being shown in the left-hand part of the figure in a condition into which it is put when the sliding door is in its fully closed position and in the right-hand part of the figure in a condition into which it is put when the sliding door is in its fully open position;

Fig.3 is a view taken along the arrow III of Fig. 2;

Fig. 4 is a perspective view of a roller bracket employed in the sliding door mounting of Fig. 2;

Fig. 5 is a schematic view showing a swinging of the sliding door mounting of Fig. 2 and the resulting movement of the holding means;

Fig. 6 is a view similar to Fig. 2 but showing the holding means according to the present invention;

Fig. 7a is a partly sectional fragmentary view of the holding means of this invention in one operating condition;

Fig. 7B is a view similar to Fig. 7A but showing the holding means of this invention in another operating condition;

Fig. 8 is a schematic top plan view of a hooked lever employed in the holding means of this invention;

Fig. 9 is a view taken along the arrow IX of Fig. 8;

Fig. 10 is a partly cutaway top plan view of an anchor bracket employed in the sliding door mounting of this invention;

Fig. 11 is a view taken along the arrow XI of Fig. 10;

Fig. 12 is a schematic view of the holding means of this invention together with a sliding door in its fully closed position;

Fig. 13 is a schematic view of the holding means of this invention and a sliding door in its fully open position; and

Fig. 14 is a schematic view showing a swinging of the sliding door mounting of Fig. 6 and the holding means of this invention which are held stationary irrespective of the swinging.

Referring to Figs. 1 to 5, description is first made to the prior art holding means for the purpose of analyzing the aforementioned disadvantages encountered therein.

In Fig. 1, a sliding door 10 of a motor-van or box-type vehicle is shown in its fully closed position where it lies flush with a side wall 12 of a vehicle body 14. The sliding door 10 is suspended at three points, i.e., at its front end at the top A and bottom B and at its rear end C in such a manner that upon opening, it first projects outward of the vehicle body 14 and then slides parallely along the vehicle side wall 12 toward its fully open position.

Fig. 2 shows a sliding door mounting 16 for the suspension at the rear end C. The mounting 16 comprises a guide track or rail 18 secured to the vehicle body 14 and a roller assembly 20 in hinged or pivotal connection to the rear end of the sliding door 10 and adapted to run along the guide rail 18. The roller assembly 20 consists of a roller bracket 22 shaped as shown in Fig. 4, a pair of first rollers 24 spaced from each other in the direction of the width of the sliding door 10 and a second roller 26 intervening between the first rollers 24. The roller bracket 22 is pivotally connected via a pivot pin 28 to an anchor bracket 30 which is in turn secured to an inner panel 10a of the sliding door 10. The first rollers 24 are horizontally disposed and rotatable in a horizontal plane or rotatable about vertical axes, while the second roller 26 is disposed vertically and rotatable in a vertical plane or rotatable about a horizontal axis. The first and second rollers 24 and 26 are rotatably carried on the roller bracket 22 and guided by the guide rail 18 having a channel-like cross section as shown in Fig. 3. The guide rail 18 has a first guide rail section 18a extending along the outer surface of the vehicle side wall 12 and a second guide rail section 18b extending from the front end of the first guide rail section 18a inward of the vehicle body 14. The first guide rail section 18a is adapted to guide the sliding door 10 parallely along the outer surface of the vehicle side wall 12 while holding same in a condition projected outwardly of the vehicle side wall 12. The second guide rail section 18b is adapted to guide the sliding door 10 along a path turned laterally of the vehicle body 14 and thereby allow same to move inward or outward of the vehicle body 14, i.e., allow the sliding door 10 to be pulled in to or pulled out from a closed position where it lies flush with the vehicle side wall 12.

When the sliding door 10 is in the closed position, the roller assembly 20 is put into such a condition shown in the left-hand part of Fig. 2, i.e., received in the space between the second guide rail section 18b and the inner panel 10a of the sliding door 10. When the sliding door 10 is in the fully open position, the roller assembly 20 is put into a condition as shown in the right-hand part of Fig. 2.

The sliding door mounting 16 further comprises holding means 30 for holding the sliding door 10 in its fully open position. The holding means 30 consist of a hooked lever 32 mounted on the roller assembly 20 in a manner to pivot about the pivot pin 28, a stopper 34 secured to the guide rail 18 for engagement with the hooked lever 32, and a spring 36 placed around the pivot pin 28 in a manner to urge the hooked lever 32 in the counterclockwise direction in the drawing, i.e., in the direction for engagement with the stopper 32. As best shown in the right-hand part of Fig. 2 (at the partly cutaway portion), the hooked lever 32 is adapted to abut at 32a upon a corresponding vertical wall portion 22a of the pivotal bracket 22 under the bias of the spring 36. When the hooked lever 32 goes over the stopper 34, it is rotated clockwise in the drawing against the bias of the spring 36 while at the same time allowing the abutment portion 32a to go away from the corresponding vertical wall portion 22a of the roller bracket 22. The hooked lever 32 is held stationary relative to the pivotal bracket 22 or held movable together with the same except the case where it is driven by the stopper 34 to rotate clockwise in the drawing.

With such holding means 30, when the sliding door 10 is moved into the fully open position, the hooked end 32b of the lever 32 is caused to go over the stopper 34 and is put into engagement with same under the bias of the spring 36, whereby holding the sliding door 10 in the fully open position. The hooked lever 32 can be disengaged from the stopper 34 by rotating a release lever 38 clockwise in the drawing, which is connected via a rod 40 to an unshown outside door handle and adapted to push at its end 38a a release finger 32c of the hooked lever 32, and thereby cause the hooked lever 32 to rotate in the corresponding direction.

In the foregoing structure, there are provided small clearances between the guide rail 18 and the rollers 24 and 26, and the guide rail 18 itself is not accurately flat but has some inequality of surface. This may permit the roller assembly 20 to swing as shown in Fig. 5 even when it is guided by the first guide rail section 18a. Due to this, the hooked end 32b of the lever 32 may possibly be pressed against the guide rail 18 to make a disturbing noise or upon going over the stopper 34 the hooked end is subjected to a large pressure to make a disturbing noise or the hooked end 32a may possibly assume a position that is too far away from the stopper 34 to allow the former to engage the latter.

Further, upon closing of the sliding door 10, the roller assembly 20 is caused to rotate about the pivot pin 28 clockwise in the drawing. Together with the roller assembly 20, the hooked lever 32 is also caused to rotate in the corresponding direction. The hooked lever 32 is thus subject to design restriction resulting not only from the limited space between the second guide rail section 18b and the inner panel 10a of the sliding door 10 but also from the angle of rotation of the roller assembly 20 upon closing of the sliding door 10. Due to this design restriction, it is, in effect, impossible to increase the width of the hooked end 32b of the lever 32 for the purpose of reducing the foregoing pressure to which it is subject upon going over the stopper 34 or to increase the width of the hooked lever 32 for the purpose of increasing the strength thereof.

The foregoing disadvantages encountered in the

prior art holding means can be obviated or avoided by the holding means of the present invention which will be described hereinafter with reference to Figs. 6 to 14, in particular.

In Figs. 6 to 14, like and corresponding parts and portions to those of the foregoing prior art arrangement are designated by like reference numerals and will not be described again for brevity.

The holding means of this invention are generally designated by 42 and comprises a hooked lever 44 having, as best shown in Figs. 8 and 9, a hooked end 44a for engagement with a stopper 34, a bearing portion 44b located adjacent an end oppposite to the hooked end 44a for pivotal mounting thereat on a pivot pin 28 and a release finger 44c adapted to be pushed by an end 38a of a release lever 38. The hooked lever 44 also has a first abutment portion 44d at the end opposite to the hooked end 44a and a second abutment portion 44e located between the hooked end 44a and the bearing portion 44b. The first abutment portion 44d is adapted to abut upon an anchor bracket 46, as best shown in Fig. 7A, under the bias of a spring 36 when the sliding door 10 is in its fully open position as shown in the right-hand part of Fig. 6 or a roller assembly 20 is being guided by a first guide rail section 18a of a guide rail 18.

As shown in Figs. 10 and 11, the anchor bracket 46 is channel-shaped and has a pair of horizontal walls 46a between which the pivot pin 28 spans and a vertical wall 46b having an abutment portion 46c for abutment with the first abutment portion 44d of the hooked lever 44. The anchor bracket 46 is provided with a plurality of nuts 46d, though only one is shown, for attachment to a sliding door inner panel 10a. By the anchor bracket 46 and the pivot pin 28, a roller assembly 20 is hingedly connected to the rear end of the sliding door 10 similarly to the foregoing prior art arrangement.

In the case where the first abutment portion 44d is in contact with the corresponding vertical wall portion 46c of the anchor bracket 46 under the bias of the spring 36, the second abutment portion 44e is out of contact with a corresponding vertical wall portion 22a of a pivotal bracket 22 and spaced a predetermined distance away from same as best shown in Fig. 7A. When the roller assembly 20 comes to run along a second guide rail section 18b, it is caused rotate clockwise in the drawing relative to the hooked lever 44, allowing the vertical wall portion 22a of the pivotal bracket 22 to go nearer to the second abutment portion 44e and eventually abut upon same as best shown in Fig. 7B. This abutment is adapted to occur when the roller assembly 20 runs into a predetermined position on the way to its extreme position where it holds the sliding door 10 in the fully closed condition, that is, when the roller assembly 20 is caused to rotate by a second guide rail section 18b a predetermined angle. The hooked lever 44 is thenceforth caused to rotate clockwise in the drawing, with the second abutment portion 44e being held in contact with the vertical wall portion 22a of the roller bracket 22, while at the same time allowing the first abutment portion 44d to go increasingly away from the vertical wall portion 44d of the anchor bracket 46 as it rotates with the roller assembly 20.

In Figs. 12 and 13, there is shown an outside handle 48 which is connected via a rod 40 to the release lever 38.

The operation of the holding means 42 of this invention will now be described hereinafter.

In Fig. 13 and in the left-hand part of Fig. 6, the sliding door 10 is shown in its fully open position. When it is desired to close the sliding door 10, the outside handle 48 is operated to pull the rod 40 leftward in the drawing and thereby rotate the release lever 38 clockwise in the drawing. By this, the hooked lever 44 is rotated clockwise in the drawing and disengaged from the stopper 34 since it is adapted to be pushed at the release finger 44c by the end 38a of the release lever 38. After disengagement of the hooked lever 44 from the stopper 34, the sliding door 10 is displaced from the fully open position and moved toward its fully closed position. During the movement of the sliding door 10 toward the fully closed position, the roller assembly 20 is first guided by the first guide rail section 18a and then by the second guide rail section 18b. The second guide rail section 18b causes the roller assembly 20 to rotate clockwise in the drawing. In this connection, the roller assembly 20 starts rotating as it begins to be guided by the second guide rail section 18b and rotates increasingly as it goes nearer to its extreme position where it holds the sliding door 10 in the fully closed position. In this rotation of the roller assembly 20, the second abutment portion 44e of the hooked lever 44 comes in contact with the corresponding vertical wall portion 22a of the roller bracket 22 when the roller assembly 20 runs into a predetermined position on the way to the extreme position or when the roller assembly 20 is rotated a predetermined angle which is smaller than a maximum angle that it can rotate. From this time onward, the hooked lever 44 rotates together with the roller bracket 22 and therefore the roller assembly 20 until the roller assembly 20 moves to the extreme position. In this manner, the sliding door 10 is moved to the fully closed position as shown in Fig. 12 and also in the left-hand part of Fig. 6.

In the foregoing, at the very time when the second abutment portion 44e comes in contact with the corresponding vertical wall portion 22a of the roller bracket 22, the first abutment portion 44d is still in contact with the corresponding vertical wall portion 46d of the anchor bracket 46. However, from this time onward, the first abutment portion 44d goes further away from the corresponding vertical wall portion 46c as the hooked lever 44 rotates together with the roller assembly 20.

In the opening movement of the sliding door 10 from the fully closed position, the roller assembly 20 is rotated counterclockwise as it runs along the second guide rail section 18b toward the first guide rail section 18a. In this counterclockwise rotation of the roller assembly 20, the first abutment portion 44d of the hooked lever 44 comes in contact with the corresponding vertical wall portion 46c of the anchor bracket 46 when the roller assembly 20 runs into the aforementioned predetermined position. From this time onward, the hooked lever 44 is held stationary relative to the anchor bracket 46 and only the roller assembly 20 rotates further as it goes farther away from the extreme position.

The roller assembly 20 is then guided by the first guide rail section 18a, allowing the sliding door 10 to move parallelly along the side wall 12 of the vehicle body 14 toward the fully open position. When the sliding door 10 comes close to the fully open position, the hooked end 44a of the lever 44 is caused to ride on the stopper 34 and is rotated clockwise in the drawing against the bias of the spring 36. When the sliding door 10 is fully opened, the hooked end 44a of the lever 44 is caused to go over the stopper 34 and be brought into engagement with same under the bias of the spring 36.

In the movement of the roller assembly 20 along the first guide rail section 18a, the first abutment portion 44d of the hooked lever 44 is held in contact with the vertical wall portion 46c of the anchor bracket 46, while the second abutment portion 44e is held out of contact with the vertical wall portion 22a of the roller bracket 22. Due to this arrangement, the hooked end 44a of the lever 44 can always assume a suitable position for engagement with the stopper 34 irrespective of the swinging of the roller assembly 20 as shown in Fig. 14. Further, the hooked end 44a is prevented from being pressed against the guide rail 18 even if the roller assembly 20 is caused to swing as shown in Fig. 14.

From the foregoing, it is to be understood that the holding means 42 of the present invention is free from the disadvantage of making a disturbing noise when a sliding door is being opened or closed.

It is further to be understood that the holding means 42 of this invention can effect an assured and reliable operation in holding a sliding door in its fully open position.

It is still further to be understood that the hooked lever 44 is free from the design restrictions encountered in the prior art and can be designed relatively freely since the angle which the hooked lever 44 rotates together with the roller assembly 20 when running along the second guide rail section 18b can be set smaller.

CLAIMS

1. A sliding door mounting in a motor vehicle, having a guide rail secured to the vehicle body, an anchor bracket secured to a sliding door, a roller assembly pivotally mounted on the anchor bracket and adapted to run along the guide rail, the guide rail having a first guide rail section adapted to guide the sliding door substantially parallelly along the outer surface of the vehicle body while holding same in a condition projected outward of the vehicle body and a second guide rail section adapted to guide the sliding door along a path turned laterally of the vehicle body and thereby allow same to be pulled in to or pulled out from its fully closed position where it lies flush with the outer surface of the vehicle body, the roller assembly being caused to rotate relative to the sliding door when running along the second guide rail section, and means for holding the sliding door in its fully open position, the holding means having a stopper secured to the guide rail, a hooked lever pivotally mounted on the roller assembly for engagement with the stopper when the sliding door is in its fully open position and a spring urging the hooked lever in the direction for engagement with the stopper, CHARACTERIZED IN THAT said hooked lever has a first abutment portion for contact with a corresponding portion of said anchor bracket under the bias of said spring and a second abutment portion for contact with a corresponding portion of said roller assembly under the bias of said spring, THAT said first abutment portion is adapted to be held in contact with said corresponding portion of said anchor bracket at least when said roller assembly is running along said first guide rail section for thereby holding said hooked lever in a predetermined constant condition suitable for engagement with said stopper irrespective of rotation of said roller assembly, and THAT said second abutment portion is adapted to come in contact with said corresponding portion of said roller assembly when said roller assembly, which is running along said second guide rail section toward its extreme position where it holds said sliding door in its fully closed position, runs into a predetermined position and thenceforth to cause said hooked lever to rotate together with said roller assembly while at the same time allowing said first abutment portion to go away from said corresponding portion of said anchor bracket.

2. A sliding door mounting as set forth in claim 1, CHARACTERIZED IN THAT said first abutment portion is adapted to be also held in contact with said corresponding portion of said anchor bracket when said roller assembly is running along an area of said second guide rail section other than an area between said extreme position and said predetermined position.

3. A sliding door mounting as set forth in claim 1, CHARACTERIZED IN THAT said second abutment portion is adapted to be spaced a predetermined distance from said corresponding portion of said roller assembly at least when said roller assembly is running along said first guide rail section.

4. A sliding door mounting as set forth in claim 1, CHARACTERIZED IN THAT said hooked lever also has a hooked end for engagement thereat with said stopper and a bearing portion located adjacent an end opposite to said hooked end for pivotal mounting thereat on said roller assembly, said first abutment portion being located at an end opposite to said hooked end and said second abutment portion being located between said hooked end and said bearing portion.

5. A sliding door mounting as set forth in claim 4, wherein said anchor bracket is secured to the rear end of said sliding door and channel-shaped to have a pair of horizontal walls and a vertical wall, said roller assembly being adapted to pivot about a pivot pin spanning between said horizontal walls, CHARACTERIZED IN THAT said corresponding portion of said anchor bracket comprises an abutment portion formed in said vertical wall.

6. A sliding door mounting as set forth in claim 5, wherein said roller assembly has a roller bracket adapted to pivot about said pivot pin, a pair of horizontally-disposed rollers spaced from each other in the direction of the width of said sliding door and a vertically-disposed roller intervening between said horizontally-disposed rollers, CHARACTERIZED IN THAT said corresponding portion of said roller

assembly comprises a vertical wall portion of said roller bracket.

7. A sliding door mounting characterized by means for holding a sliding door in its fully open position, substantially as described herein with reference to Figs. 1, and Figs. 6 to 14 of the accompanying drawings.

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